

Technical Report 5-20579 & 5-20580
Contract No. DAAH01-98-D-R001
Delivery Order No. 44

**Research and Evaluation of Advanced
Missile Component Technologies
(5-20579 & 5-20580)**

Final Technical Report for Period
30 April 1999 through 30 September 1999

October 1999

Prepared by:

Gary A. Maddux

Research Institute
The University of Alabama in Huntsville
Huntsville, Alabama 35899

Prepared for:

U.S. Army Aviation & Missile Command
Redstone Arsenal, AL 35898
Attn.: Mr. Daron Holderfield

20000309 096

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.

| | | | | |
|--|---|--|--|---|
| 1. AGENCY USE ONLY (Leave blank) | | | 2. REPORT DATE October 99 | 3. REPORT TYPE AND DATES COVERED Final Report: 30 APR 99 thru 30 SEP 99 |
| 4. TITLE AND SUBTITLE RESEARCH AND EVALUATION OF ADVANCED MISSILE COMPONENT TECHNOLOGIES | | | 5. FUNDING NUMBERS | |
| 6. AUTHOR(S) Gary A. Maddux | | | | |
| 7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Univ. of Alabama in Huntsville Huntsville, AL 35899 | | | 8. PERFORMING ORGANIZATION REPORT NUMBER 5-20579 & 5-20580 | |
| 9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES) AMSAM-RD-SE-MT (D. HOLDERFIELD) U.S. Army Aviation & Missile Command Redstone Arsenal, AL 35898 | | | 10. SPONSORING / MONITORING AGENCY REPORT NUMBER | |
| 11. SUPPLEMENTARY NOTES | | | | |
| 12a. DISTRIBUTION / AVAILABILITY STATEMENT Approved for Public Release; Distribution is unlimited. | | | 12b. DISTRIBUTION CODE A | |
| 13. ABSTRACT (Maximum 200 words) The Research, Development and Engineering Center (RDEC), U.S. Army Aviation and Missile Command (AMCOM) has the mission and function for investigating advanced missile components technology for weapon systems that should have positive impacts on the producibility, operations and support of future aviation and missile designs. During FY99 the RDEC is focusing on the technology areas of Electronic, Photonic, Electro-Optical and Electro-Magnetic Materials; Multispectral Sensors Modeling and Simulation; and Applications of Nanotechnology to Tactical Missile Systems. The Systems Engineering and Production Directorate, RDEC, AMCOM has the mission and function of evaluating new technologies and determining the impacts of same on the producibility and supportability of AMCOM missile systems. The UAH Systems Management and Production Laboratory was tasked to provide this engineering support and analytical capability. | | | | |
| 14. SUBJECT TERMS multispectral sensors; nanotechnology; emerging technologies | | | 15. NUMBER OF PAGES 2 | |
| | | | 16. PRICE CODE | |
| 17. SECURITY CLASSIFICATION OF REPORT | 18. SECURITY CLASSIFICATION OF THIS PAGE | 19. SECURITY CLASSIFICATION OF ABSTRACT | 20. LIMITATION OF ABSTRACT | |

PLEASE CHECK THE APPROPRIATE BLOCK BELOW

DAO# _____

_____ copies are being forwarded. Indicate whether Statement A, B, C, D, E, F, or X applies.



DISTRIBUTION STATEMENT A:

APPROVED FOR PUBLIC RELEASE: DISTRIBUTION IS UNLIMITED

DISTRIBUTION STATEMENT B:

DISTRIBUTION AUTHORIZED TO U.S. GOVERNMENT AGENCIES ONLY; (indicate Reason and Date). OTHER REQUESTS FOR THIS DOCUMENT SHALL BE REFERRED TO (Indicate Controlling DoD Office).

DISTRIBUTION STATEMENT C:

DISTRIBUTION AUTHORIZED TO U.S. GOVERNMENT AGENCIES AND THEIR CONTRACTS (Indicate Reason and Date). OTHER REQUESTS FOR THIS DOCUMENT SHALL BE REFERRED TO (Indicate Controlling DoD Office).

DISTRIBUTION STATEMENT D:

DISTRIBUTION AUTHORIZED TO DoD AND U.S. DoD CONTRACTORS ONLY; (Indicate Reason and Date). OTHER REQUESTS SHALL BE REFERRED TO (Indicate Controlling DoD Office).

DISTRIBUTION STATEMENT E:

DISTRIBUTION AUTHORIZED TO DoD COMPONENTS ONLY; (Indicate Reason and Date). OTHER REQUESTS SHALL BE REFERRED TO (Indicate Controlling DoD Office).

DISTRIBUTION STATEMENT F:

FURTHER DISSEMINATION ONLY AS DIRECTED BY (Indicate Controlling DoD Office and Date) or HIGHER DoD AUTHORITY.

DISTRIBUTION STATEMENT X:

DISTRIBUTION AUTHORIZED TO U.S. GOVERNMENT AGENCIES AND PRIVATE INDIVIDUALS OR ENTERPRISES ELIGIBLE TO OBTAIN EXPORT-CONTROLLED TECHNICAL DATA IN ACCORDANCE WITH DoD DIRECTIVE 5230.25. WITHHOLDING OF UNCLASSIFIED TECHNICAL DATA FROM PUBLIC DISCLOSURE, 6 Nov 1984 (indicate date of determination). CONTROLLING DoD OFFICE IS (Indicate Controlling DoD Office).

This document was previously forwarded to DTIC on _____ (date) and the AD number is _____.

In accordance with provisions of DoD instructions. The document requested is not supplied because:

It will be published at a later date. (Enter approximate date, if known).

Other. (Give Reason)

DoD Directive 5230.24, "Distribution Statements on Technical Documents," 18 Mar 87, contains seven distribution statements, as described briefly above. Technical Documents must be assigned distribution statements.

GARY A. MADDUX

Print or Type Name

Gary A. Maddux 26 Oct 99
Authorized Signature/Date

256 890 6343 x 223

Telephone Number

PREFACE

This technical report was prepared by the staff of the Research Institute, The University of Alabama in Huntsville. The purpose of this report is to provide documentation of the work performed and results obtained under Delivery Order 44 of AMCOM Contract No. DAAH01-98-D-R001. Mr. Gary Maddux was the principal investigator. Ms. Sherry Starling and Ms. Angie Cornelius served as lead technicians. Mr. Daron Holderfield, Systems Engineering and Production Directorate, Research, Development, and Engineering Center, U.S. Army Aviation & Missile Command, provided technical coordination. Mr. William Pittman, Missile Guidance Directorate, U.S. Army Aviation and Missile Command, provided technical expertise and insights in advanced missile component technologies.

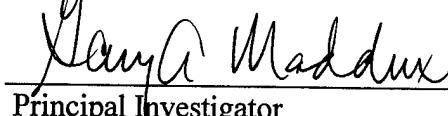
The views, opinions, and/or findings contained in this report are those of the author(s) and should not be construed as an official Department of the Army position, policy, or decision unless so designated by other official documentation.

Except as provided by the Contract Data Requirements List DD Form 1423, hereof, the distribution of any contract report in any state of development or completion is prohibited without the approval of the Contracting Officer.

Prepared for: Commander

U.S. Army Aviation & Missile Command
Redstone Arsenal, AL 35898

I have reviewed this report, dated October 1999 and the report contains no classified information.



Principal Investigator

TABLE OF CONTENTS

| | | |
|-----|---------------------------------------|---|
| 1.0 | INTRODUCTION..... | 1 |
| 2.0 | OBJECTIVES | 1 |
| 3.0 | STATEMENT OF WORK | 1 |
| 4.0 | DESCRIPTION OF WORKSHOPS..... | 2 |
| 5.0 | CONCLUSIONS AND RECOMMENDATIONS | 2 |

1.0 Introduction

The Research, Development and Engineering Center (RDEC), U.S. Army Aviation and Missile Command (AMCOM) has the mission and function for investigating advanced missile components technology for weapon systems that should have positive impacts on the producibility, operations and support of future aviation and missile designs. During FY99 the RDEC is focusing on the technology areas of Electronic, Photonic, Electro-Optical and Electro-Magnetic Materials; Multispectral Sensors Modeling and Simulation; and Applications of Nanotechnology to Tactical Missile Systems.

The Systems Engineering and Production Directorate, RDEC, AMCOM has the mission and function of evaluating new technologies and determining the impacts of same on the producibility and supportability of AMCOM missile systems. Contractor support was required to augment RDEC sponsored workshops to investigate emerging applications in these technology areas. The Systems Management and Production Laboratory at The University of Alabama in Huntsville (UAH) Research Institute (RI) was tasked to provide this engineering support and analytical capability.

2.0 Objective

The objective of this research task was to research and identify organizations and experts working within the above technology areas, facilitate interactions with the RDEC in the form of technical papers/briefings, and develop knowledge bases that could be disseminated throughout the DoD and incorporated in the appropriate weapon systems planning. UAH conducted research to identify and categorize these technologies based on the potential for DoD weapons applications and manufacturing technology maturity.

3.0 Statement of Work

The statement of work, as outlined in delivery order 44, was as follows:

UAH shall provide the personnel, resources, expertise and materials required to perform the following efforts:

- 3.1 UAH shall conduct independent research to complement AMCOM, RDEC sponsored technology workshops in the areas of Electronic, Photonic, Electro-Optical and Electro-Magnetic Materials; Multi-spectral Sensors Modeling and Simulation; and Applications of Nanotechnology to Tactical Missile Systems. The independent research shall provide documentation on specific technology applications with regard to viability for military systems requirements, and identify specific experts in each area.

3.2 UAH shall establish a database to represent each technology area and provide emerging component performance characteristics or manufacturing process details. Coordination with research and engineering principals shall be accomplished for workshop requirements planning and to improve the technical presentations. All data shall be requested in electronic format and transferred to the Government for appropriate distribution.

4.0 Description of Workshop

The work performed on this task led directly to *Workshop on Hyperspectral/Multispectral Sensors Measurements Modeling and Simulation* on September 7-9, 1999 at the Sparkman Center, Redstone Arsenal, Alabama. The objective of this workshop was to review research progress in hyperspectral / multispectral sensor measurements modeling and simulation including multispectral target and background scenes, calibration and validation processes, algorithm development and performance measures for potential technology insertion in current tactical and strategic weapon systems, as well as for new systems. A second objective was to identify research and development gaps in the technology that must be filled to achieve Army and DoD program objectives.

5.0 Conclusion and Recommendations

During the time frame allocated by the delivery order, members of the UAH Applied Research Program, with the cooperation of representatives from AMCOM SEPD and Missile Guidance, performed an analysis and evaluation of advanced missile component technologies that could be incorporated into weapon system design. Results of these efforts were presented at a locally held workshop. Detailed findings can be found in the proceedings of that workshop, which was compiled by UAH and delivered under separate cover.